REMARKS

Claims 2-23 are currently pending in this application. By the foregoing amendment, Applicants have amended claims 2, 16, 18, and 21. Specifically, claims 2, 16, 18, and 21 have been amended to recite that the light beam impacts the conveyor at a nonzero angle relative to a perpendicular extending therefrom. The recitation that the light beam impacts the conveyor, when not obstructed by an object, at a non-zero angle relative to a perpendicular is supported by originally filed Figure 5. No new matter has been added to the application by this Amendment.

INTERVIEW

Examiner Pham and Applicants' representative discussed the patentability of the claims, as now amended, during a telephone interview on October 2, 2002. In the Office Action of June 18, 2002, Examiner Pham pointed out that the pending claims could be interpreted to include a zero angle relative to a perpendicular. To address this matter, the claims have been amended to recite a nonzero angle relative to a perpendicular.

Examiner Pham's Interview Summary states, *inter alia*, that "Applicant agreed that the claimed language is read on the teachings of the references." Applicants respectfully disagree. Applicants' representative only agreed that, under the strictest claim interpretation, it can be argued that the claimed "angle" may include a zero angle.

Examiner Pham agreed that, subject to a review of the prior art cited in this application, the inclusion of the term "nonzero" should place the claims in condition for allowance.

Applicants thank Examiner Pham for the many courtesies extended during the interview.

SMALL ENTITY STATUS

Applicants now qualify for small entity status. Applicants respectfully request that the Examiner record Applicants' small entity status in Applicants' file.

CLAIM REJECTIONS - 35 U.S.C. §103

The Examiner has rejected claims 2-23 under 35 U.S.C. §103(a) as being unpatentable over Kakinoki et al. (U.S. Patent No. 5,004,929) in view of Schmutz (U.S. Patent No. 5,555,090). Applicants respectfully traverse this rejection as applied to the amended claims.

One embodiment of Applicants' invention is directed to a system for dimensioning objects that uses at least one light beam which impacts the conveyor at a non-zero angle relative to a perpendicular extending therefrom. The reflections from the light beam striking the conveyor or an object positioned thereon are detected by a detector having a field of view which extends along the perpendicular. Referring to Figure 5, the object 14 height at

a given point is measured by triangulation using the offset angle θ. This offset angle θ between the laser beam 21 and the normal camera field of view 42 above the conveyor creates a horizontal offset *d* between the intercept point 40a where the laser beam normally intercepts the conveyor surface and an image point 40b where the laser beam 21 strikes the object 14 supported thereon. This offset *d* is detected by the detector's field of view 42. Thus, when the intercept point 40a and the image point 40b are the same, the detector determines that no object is present. (Specification, page 8, lines 11-23). When a difference exists between intercept point 40a and image point 40b, the dimensioning system uses the data to determine a desired measurement of the object.

To establish a *prima facie* case of obviousness, "the prior art reference (or references when combined) must teach or suggest all the claim limitations" (MPEP § 2142).

Applicants' claims 2, 16, 18, and 21, each recite, *inter alia*, "wherein the light beam, when not obstructed by the object, impacts the conveyor at an angle relative to a perpendicular extending therefrom."

Kakinoki et al. are directed to an optical system for measuring an object. Referring to Figure 4, a light beam L_5 that impacts the conveyor or an object thereon is oriented perpendicular to the conveyor. Thus, the scanning beam L_5 is "directly and vertically incident upon the object 50 from above" (Specification, col. 5, lines 20-21). In complete

contradiction with Applicants' invention, Kakinoki et al. rely upon the reflected light beam L_6 to be angularly offset from the light beam that impacts the object or the conveyor in order to measure the object. This small inclination angle between the light beam L_5 (which is perpendicular to the conveyor) and the reflected light L_6 results in the reflected light L_6 being reflected by a combination of mirrors to condense the light using a converging lens 33 onto an optical detector 35 (Specification, col. 5, lines 29-43). Kakinoki et al. fail to disclose, teach or suggest a dimensioning system that uses a light beam that impacts a conveyor at an angle relative to a perpendicular extending from the conveyor.

The deficiencies in the teachings of Kakinoki et al. are not remedied by Schmutz. Schmutz is directed to a system for dimensioning objects. Referring to Figure 2, light is generated by a source 20 which generates an energy beam having a structured pattern (Specification, Col. 2, lines 59-63). As clearly shown in Figure 2, the energy beam is directed perpendicularly toward an object 10 and the object supporting surface. A sensor 80 is used to determine the irradiation caused by the object to determine a dimension of the object. Schmutz completely fails to disclose, teach or suggest a light beam which impacts the conveyor at an angle relative to a perpendicular extending from the conveyor.

Applicants respectfully submit that Kakinoki et al. and Schmutz fail to disclose Applicants' element, recited in each of claims 2, 16, 18, and 21, of "wherein the light beam,

when not obstructed by the object, impacts the conveyor at a non-zero angle relative to a perpendicular extending therefrom." As described above, both Schmutz and Kakinoki et al. rely on the light beams or energy beams being oriented perpendicular to an object or an object supporting surface. Applicants respectfully submit that the recited combination fails to disclose, teach or suggest each of Applicants' elements. Applicants respectfully submit that claims 2, 16, 18 and 21 are patentable over the cited references. Additionally, claims 3-15, 17, 19, 20, 22 and 23 depend, directly or indirectly, upon one of claims 2, 16, 18, and 21 and, accordingly, are also patentable over the cited combination for at least the above-stated reason.

Applicants respectfully request that the Examiner reconsider and withdraw the Section 103 rejection of claims 2-23 using Kakinoki et al. in view of Schmutz.

The Examiner has rejected claims 2-23 under 35 U.S.C. §103(a) as being unpatentable over Nordbryhn (U.S. Patent No. 4,996,440) in view of Schmutz.

Applicants' claims 2, 16, 18, and 21 recite, *inter alia*, "wherein the light beam, when not obstructed by the object, impacts the conveyor at a non-zero angle relative to a perpendicular extending therefrom."

Nordbryhn is directed to a device for measuring dimensions. Referring to Figure 1, a laser 3 generates a light beam 4 that is reflected off of a small mirror 5. The small mirror

5 reflects the light beam 4 perpendicularly downwardly toward a rotating, angled flat mirror 1. The flat mirror 1 is rotated by a motor 2 which causes the reflected light beam 4 to be horizontally reflected toward an innersurface of a hollow truncated cone mirror 7. When the light beam 4 is reflected off of the innersurface of the cone mirror 7, the light beam is directed toward an object 8 along a perpendicular relative to the object. Back reflections from the object 8 are sent to a light receiver 9 via the hollow truncated cone 7 and the flat mirror 1. Referring to Figure 5, the light beams extending from another embodiment of a stationary measuring device 22 also impact on the conveyor along a perpendicular extending from the conveyor. Figure 9 illustrates another embodiment formed by an array of light generating elements each projecting a light beam perpendicularly onto a surface. Nordbryhn utterly fails to disclose, teach or suggest the use of a light beam that impacts a conveyor at an angle relative to a perpendicular extending from the conveyor. As discussed above in regard to the first Section 103 rejection, Schmutz also fails to disclose such an element.

Applicants respectfully submit that Nordbryhn and Schmutz fail to disclose Applicants' element, recited in claims 2, 16, 18, and 21, of "the light beam, when not obstructed by the object, impacts the conveyor at a non-zero angle relative to a perpendicular extending therefrom". Accordingly, Applicants respectfully submit that claims 2, 16, 18, and 21 are patentable over the cited combination. Additionally, claims 3-15, 17, 19, 20, 22,

and 23 depend, directly or indirectly on one of claims 2, 16, 18, and 21 and, accordingly, are also patentable over Nordbryhn and Schmutz for at least the above discussed reason.

Applicants respectfully request that the Examiner reconsider and withdraw the Section 103 rejection of claims 2-23 using Nordbryhn and Schmutz.

INVITATION

If the Examiner believes that any additional formal matters need to be addressed to place this application in condition for allowance, the Examiner is respectfully invited to contact the undersigned, by telephone, at the Examiner's convenience.

CONCLUSION

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 2-23, is in condition for allowance and a notice to that effect is respectfully solicited.

Respectfully submitted,

Wurz et al.

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MARKED UP VERSION OF CLAIMS

2. (Amended Twice) An apparatus for measuring an object on a conveyor having a width, the apparatus comprising:

a chassis;

a mirrored wheel rotatably located on the chassis;

a light source positioned on the chassis and oriented to transmit a light beam in a fixed direction onto the mirrored wheel, wherein when the wheel rotates the light beam is reflected while also being sequentially redirected at one of a plurality of varying angles resulting in the motion of the light beam, which is reflected from the mirrored wheel, defining a path oriented generally perpendicularly to the light beam;

a reflecting surface located on the chassis and oriented to receive the light beam that is reflected off of the mirrored wheel and to redirect the light beam toward the conveyor such that the path defined by the light beam extends generally across the width of the conveyor, wherein the light beam, when not obstructed by the object, simpacts the conveyor at **[an]** **a nonzero** angle relative to a perpendicular extending therefrom;

a detector disposed on the chassis and having a field of view initially oriented toward the mirrored wheel, wherein the field of view is redirected via the mirrored wheel and the reflecting surface to allow the detector to detect a reflection of the light beam off of one of the conveyor and the object at a plurality of locations as the light beam moves along the path across the conveyor.

16. (Amended) A method of measuring an object on a conveyor, comprising:

emitting a single light beam in a fixed direction;

sequentially reflecting the light beam through a plurality of varying angles causing the motion of the reflected light beam to define a path generally perpendicular to the light beam, wherein the path extends generally across a width of the conveyor, wherein the light beam, when not obstructed by the object, impacts the conveyor at **[an]** **a nonzero** angle relative to a perpendicular extending therefrom;

detecting the reflection of the reflected light beam off of one of the object and the conveyor at a plurality of locations along the path; and

determining a height profile, relative to the conveyor, along the path.

18. (Amended Twice) A method for determining the dimensions of one or more objects on a conveyor, comprising the steps of:

directing at least one light beam onto the conveyor at a plurality of locations along the path;

detecting reflections caused by the at least one light beam striking one of the conveyor and the object, wherein the light beam, when not obstructed by the object, impacts the conveyor at **[an]** **a nonzero** angle relative to a perpendicular therefrom;

collecting time and location data associated with the detected reflections; and

generating a height-profile, relative to a conveyor surface, along the path.

21. (Amended) An apparatus for measuring an object on a conveyor having a width, the apparatus comprising:

at least one light source positioned above the conveyor and adapted to transmit a light beam that when not obstructed by the object, impacts the conveyor at **[an]** **a nonzero** angle relative to a perpendicular extending therefrom, wherein the light beam impacts the conveyor at a separate one of a plurality of locations along a path extending across the width of the conveyor;

a detector disposed proximate to the conveyor and having a field of view, the field of view, when not obstructed by the object, intersects the conveyor along the perpendicular, the field of view is adapted to allow the detector to detect a reflection of the light beam off of one of the conveyor and the object at the separate one of the plurality of locations.